## CLAIMS

What is claimed is:

1. A method for fabricating a vertical-cavity surface-emitting laser (VCSEL), comprising the steps of:

providing a substrate having a back surface and a front surface, the front surface having disposed thereon a first reflector, an active region, and a second reflector, the first reflector being disposed on the front surface, the active region being interposed between the first reflector and the second reflector; and

forming anti-reflection features into the back surface of the substrate to reduce specular reflection of light into the active region.

2. The method of claim 1, wherein the anti-reflection features are anti-reflection rows.

3. The method of claim 1, wherein the step of forming anti-reflection features comprises the step of etching the anti-reflection features into the back surface of the substrate.

4. The method of claim 3, wherein the step of etching anti-reflection features comprises using a selective wet etching solution to etch the anti-reflection features.

5. The method of claim 2, wherein the anti-reflection rows have substantially triangular cross-sections.

6. The method of claim 5, wherein the angles of the substantially triangular cross-sections are designed to reduce the amount of specular reflection of light in parallel with the light generated in the active region.

7. The method of claim 3, wherein the step of etching anti-reflection features comprises using photoelectrochemical etching process to etch the anti-reflection features.

8. The method of claim 7, wherein the step of using photoelectrochemical etching process comprises scanning the back surface of the substrate with a line-focused laser.

9. The method of claim 8, wherein the anti-reflection features have the deepest cross sections when the speed of the line-focused laser is slowest.

10. The method of claim 2, wherein the anti-reflection rows have arbitrary cross-sections.

11. A VCSEL comprising:

a substrate having a back surface and a front surface;

a first reflector disposed on the front surface of the substrate;

an active region disposed on the first reflector; and

a second reflector disposed on the active region such that the active region is interposed between the first reflector and the second reflector, wherein the back surface of the substrate comprises anti-reflection features for reducing specular reflection of light into the active region.

12. The VCSEL of claim 11, wherein the anti-reflection features are anti-reflection rows.

13. The VCSEL of claim 11, wherein the anti-reflection features are etched on the back surface using a selective wet etching solution.

14. The VCSEL of claim 12, wherein the anti-reflection rows have substantially triangular cross-sections.

15. The VCSEL of claim 14, wherein the angles of the substantially triangular cross-sections are designed to reduce the amount of specular reflection of light in parallel with the light generated in the active region.

16. The VCSEL of claim 11, wherein the anti-reflection features are etched on the back surface by photoelectrochemical etching.

17. The VCSEL of claim 16, wherein the anti-reflection features are etched on the back surface by scanning the back surface with a line-focused laser.

18. The VCSEL of claim 17, wherein the anti-reflection rows have the deepest cross sections when the speed of the line-focused laser is slowest.

19. The VCSEL of claim 12, wherein the anti-reflection rows have arbitrary cross-sections.

20. An array of VCSELs, each VCSEL comprising:

a substrate having a back surface and a front surface;

a first reflector disposed on the front surface of the substrate;

an active region disposed on the first reflector; and

a second reflector disposed on the active region such that the active region is interposed between the first reflector and the second reflector, wherein the back surface of the substrate

comprises anti-reflection features for reducing specular reflection of light into the active region of each VCSEL.

21. The array of claim 20, wherein the anti-reflection features are anti-reflection rows.

22. The array of claim 21, wherein the anti-reflection rows have substantially triangular cross-sections.

23. The array of claim 22, wherein the angles of the substantially triangular cross-sections are arranged to reflect light away from the active region of each VCSEL.

24. A method for conditioning a semiconductor substrate having a back surface, the method comprising the step of forming anti-reflection features on the back surface of the substrate.

25. The method of claim 24, wherein the anti-reflection features are anti-reflection rows.

26. The method of claim 25, wherein the anti-reflection rows have substantially triangular cross-sections.

27. The method of claim 24, wherein the anti-reflection features are formed by etching the back surface with a selective wet etching solution.

28. The method of claim 24, wherein the anti-reflection features are formed by etching the back surface with photoelectrochemical etching.

29. The method of claim 28, wherein the anti-reflection features are anti-reflection rows; and wherein the anti-reflection rows are formed by scanning the back surface, in the presence of a photoelectrochemical etching solution, with a line-focused laser beam such that the etching rate is the highest when the speed of the line-focused laser beam is the slowest and the etching rate is the lowest when the speed of the line-focused laser beam is the fastest.

30. The method of claim 29, wherein the step of scanning the back surface comprises the step of varying the speed of the line-focused laser beam so as to create anti-reflection features having substantially triangular cross-sections.

31. The method of claim 29, further comprising:

fabricating a VCSEL on the semiconductor substrate; and

wherein the anti-reflection features reduce specular reflection of light into the VCSEL.

32. An apparatus for conditioning a semiconductor substrate having a back surface, in the presence of an etching solution, the apparatus comprising:

a line-focused laser beam generator for generating and applying a line-focused laser beam to the back surface of the semiconductor substrate;

a holder positioned under the line-focused laser beam generator, wherein the holder holds the semiconductor substrate in place while the semiconductor substrate is being conditioned; and

a controller communicably linked to the line-focused laser beam generator, wherein the controller controls the relative movement between the line-focused laser beam generator and the holder so as to form anti-reflection rows on the back surface of the semiconductor substrate.

33. The apparatus of claim 32, wherein the anti-reflection rows have arbitrary cross-sections.

34. The apparatus of claim 32, wherein the controller moves the line-focused laser beam generator relative to the holder.

35. The apparatus of claim 32, wherein the controller moves the holder holding the semiconductor substrate relative to the line-focused laser beam generator.

36. The apparatus of claim 32, wherein a VCSEL is fabricated on the semiconductor substrate; and wherein the anti-reflection features reduce specular reflection of light into the active region of the VCSEL.